Quantitative fluorescence tomography using a trimodality system: in vivo validation.

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Public Summary:

Scientific Abstract:

A fully integrated trimodality fluorescence, diffuse optical, and x-ray computed tomography (FT/DOT/XCT) system for small animal imaging is reported in this work. The main purpose of this system is to obtain quantitatively accurate fluorescence concentration images using a multimodality approach. XCT offers anatomical information, while DOT provides the necessary background optical property map to improve FT image accuracy. The quantitative accuracy of this trimodality system is demonstrated in vivo. In particular, we show that a 2-mm-diam fluorescence inclusion located 8 mm deep in a nude mouse can only be localized when functional a priori information from DOT is available. However, the error in the recovered fluorophore concentration is nearly 87%. On the other hand, the fluorophore concentration can be accurately recovered within 2% error when both DOT functional and XCT structural a priori information are utilized together to guide and constrain the FT reconstruction algorithm.